Ohio Agricultural Experiment Station

CIRCULAR No. 138

WOOSTER, OHIO, JUNE 21, 1913

INCREASING CROP YIELDS IN OHIO

For 20 years the Ohio Experiment Station has conducted experiments in the use of fertilizers and manure on crops grown in rotation on the thin, somewhat sandy, yellow clay upland of the Station farm in Wayne county, and for shorter periods on soils in other parts of the State.

All the land under experiment has been tile drained, the drains being placed 30 inches deep and 36 feet apart.

A part of the land has been left continuously without any manure or fertilizer, while other portions have received different combinations of fertilizing materials and manure.

After the experiments in Wayne county had been in progress for six years, lime was added to part of the land, being applied to the surface and harrowed in on land that had been plowed for corn, thus using the lime once in five years.

For the first application, in order fully to overcome the acidity of soil which had been developing for many years, the lime was used at the rate of one ton per acre of burnt lime or two tons of finely powdered, raw limestone, whichever could be got on the land in these quantities at the least expense, taking into consideration original cost, freight and labor of application. After the land had all been treated with lime the quantity was reduced to one ton per acre of ground limestone.

Since the liming was begun the following average yields have been obtained from a few of the different treatments, on crops succeeding each other in a 5-year rotation, the crops being grown on five tracts of land so that each crop was grown every year:

	Corn Bus.	Oats Bus.	Wheat Bus.	Hay	
				Clover Tons	Timothy Tons
No treatment	27.3	29.3	11.6	0.76	1.31
Limestone only	35.6	32.0	14.2	1.04	1.72
Acid phosphate	37.2	40.7	20.1	1.02	1.53
Acid phosphate and limestone	44.1	44.1	23.8	1.54	1.72
Acid phosphate and muriate of potash	45.3	44.2	21 4	1.20	1.58
Acid phosphate, muriate of potash and limestone	52.9	48.7	23.9	1.84	2.02
Acid phosphate, muriate of potash and nitrate of soda	50.5	51 4	29.3	1.48	1.90
Acid phos., mur. of potash, nitrate of soda and limestone	56.9	49.8	29.8	1.94	2.19
Yard manure	56 8	44.1	28.1	1.83	2.36
Yard manure and limestone	63.5	49.1	31.6	2.43	2.89

The yard manure and limestone have increased the corn yield by more than 36 bushels per acre, the oats by nearly 17 bushels, the wheat by 20 bushels and the combined hay crops by three and a quarter tons. The manure has been applied at the rate of 8 tons per acre each on corn and wheat, or 16 tons every five years. If we count the cost of the manure simply that of moving it from the stable to the field—say 50 cents per ton—and that of the limestone at three dollars per ton laid on the land, then the total cost of the above increase has been $11.00 every 5 years, or $2.20 annually.

If we value corn at 40 cents per bushel, oats at 30 cents, wheat at 80 cents and hay at $8.00 per ton, the total increase for each 5-year rotation has been worth $61.00; from which deducting $11.00, we have a net gain of $50.00, or $10.00 annually. Or, if we deduct only the cost of the liming from the value of the increase we have $58.00 as the produce of 16 tons of manure, or $3.60 per ton of manure.

These experiments have been made on plots of one-tenth acre each, and some farmers may hesitate to accept conclusions drawn from such small areas.

On another tract of land, originally of the same character as that used in these tests, corn, oats, wheat and clover have been grown in a 4-year rotation during the same period, these crops being grown on four 10-acre fields, each crop being grown every season.

In this experiment manure has been taken directly from the stable to the field, instead of first passing it through the barnyard and allowing it to lie there for several months, as in the other case. This manure, moreover, has been reenforced with phosphorus, carried in acid phosphate or raw phosphate rock, to make up for the phosphorus taken out of their feed, by the animals producing the

manure, in order to build up their skeletons; the phosphate being dusted in the stables at the rate of one pound per 1,000-pound animal per day. This phosphated manure has been spread on the clover sod in the fall or early winter at the rate of about 10 tons per acre and plowed under for corn, the plowed land being dressed with limestone, as in the experiments first described.

The oats receives no treatment, but the wheat receives a complete fertilizer, made up of about 200 pounds steamed bonemeal, 100 pounds acid phosphate and 40 pounds muriate of potash in the fall, followed by 60 pounds nitrate of soda in the spring, or a total of 400 pounds per acre, having the formula 4-16-5, and costing about $6.50 per acre for the materials, or at the rate of $32.50 per ton.

Allowing $5.00 for handling the manure, $3.00 for the phosphate used with it, $3.00 for the limestone and $6.50 for the fertilizer, the total cost of this treatment has been $17.50 per acre for each 4-year period, or $4.38 annually.

The outcome of this treatment has been an 8-year average of 77 bushels of corn per acre, followed by 61 bushels of oats, 33 bushels of wheat and 3⅔ tons of hay, thus giving an increase above the unfertilized yield of 50 bushels of corn, 31 bushels of oats and 21 bushels of wheat, and more than three times as much hay as has been harvested from either of the hay crops on the untreated land.

In other words, this 40-acre tract is yielding more than twice as much corn, wheat and hay as the average of Ohio, and nearly twice as much oats. Of course, not all the land in Ohio is in condition to produce such yields. Much of it is deficient in drainage and there are some areas of thin, cold clay that will require not only drainage, but also such treatment as will increase the supply of vegetable matter in the soil, before any system of fertilizing can have its full effect. But the response which is being given by soils in other parts of the State to certain parts of the treatment above described is sufficient to show that the yields of the great majority of Ohio farms may be very materially increased by measures which will be abundantly reimbursed in each year's crops.

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